Service Manual

Telephone Equipment

*DIGITAL*
Digital Answering System

Caller ID Compatible

KX-TM150B

Black Version

(for U.S.A.)
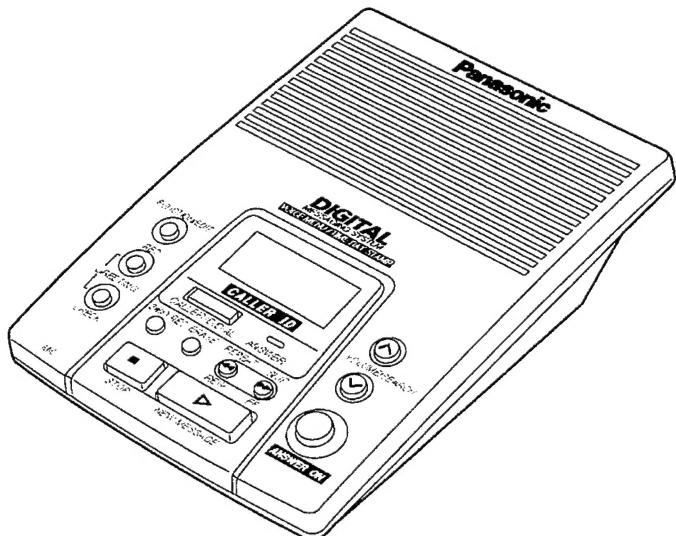
■SPECIFICATIONS

Power Source:	AC adaptor (9V, DC) PQLV1Z
Ring Control:	2~7 TOLL SAVER
Power Output:	350 mW max. across the monitor speaker
Monitor Speaker:	2 1/4" PM dynamic (8 ohm)
Microphone:	DM microphone
Connection:	2 built-in modular jacks, AC jack
Dimensions:	4 9/16" X1 11/16 " X6 9/16"
	[116 (W) X43 (H) X167 (D) mm]
Weight:	0.51 lb. (230 g)

Design and specifications are subject to change without notice.

Panasonic®

⚠ **WARNING**

This service information is designed for experienced repair technicians only and is not designed for use by the general public.
It does not contain warnings or cautions to advise non-technical individuals of potential dangers in attempting to service a product.
Products powered by electricity should be serviced or repaired only by experienced professional technicians. Any attempt to service or repair the product or products dealt with in this service information by anyone else could result in serious injury or death.

When you mention the serial number, write down all 11 digits. The serial number may be found on the label affixed to the bottom of the unit.

FOR SERVICE TECHNICIANS

ICs and LSIs are vulnerable to static electricity.
When repairing, the following precautions will help prevent recurring malfunctions.
1. Cover plastic parts boxes with aluminum foil.
2. Ground the soldering irons.
3. Use a conductive mat on worktable.
4. Do not grasp IC or LSI pins with bare fingers.

CONTENTS

1 LOCATION OF CONTROLS

CALLER ID/DIAL Button
ANSWER Indicator
Display
VOLUME/SEARCH ⊘, ⊘ Buttons

FUNCTION/EDIT Button

GREETING REC (Record) Button

GREETING CHECK Button

MIC (Microphone)

STOP Button

2WAY REC (Record) Button

ERASE Button

ANSWER ON Button

SKIP/FF (Fast Forward) Button

REPEAT/REW (Rewind) Button

NEW MESSAGE Button

2 DISPLAY

SUN 12:00AM 5 new calls 10 messages	In the stand-by mode, the display shows the current day and time, the the number of new calls and recorded messages. (Ex. 5 new calls have been received and 10 messages have been recorded.)
SUN 12:00AM 0 message	When the clock needs adjusting, the day and time flash.
TINA ROBINSON 1-000-222-3333	When a call is received, the display shows the caller's name and/or number after the first ring.
1-000-222-3333	
JACK SMITH 111-2222 11:20A JAN12a3	This is a name from the Caller List. The display shows: —the caller's name, —the caller's number, —the time and date of the last call (Ex. Jan. 12, 11:20 AM), and —the number of times called (Ex. 3 times).
5 new calls ∨=New ∧=Old	This display will be shown when CALLER ID/DIAL is pressed. To search from the most recent call, press VOLUME/SEARCH ⊘ (New key). To search from the oldest call, press VOLUME/SEARCH ⊘ (old key).

|	
No items stored	The Caller List is empty.
Greeting record Recording error	Your greeting message or your telephone conversation was not recorded correctly. Record it again.
SUN 12:00AM 2way recording Recording error	
Greeting check 00-12	A greeting message is being played. The display shows the elapsed time.
NANCY BROWN 1-000-222-3333 - Answering -	The answering system is recording a message. ("- Answering -" flashes.)
SUN 12:00AM 5 new calls Message full	Message memory is full. ("Message full" flashes.) Erase some or all of the messages.

Ex. Volume level: 5

Low ▮▮▮▮ High	The display shows the volume level. You can select from 9 levels (0–8).

3

3 CONNECTION

Fasten the cords to prevent them from being disconnected.

Power Outlet (AC 120V, 60 Hz)

AC adaptor

Single-Line Telephone Jack (RJ11C)

Telephone Line Cord
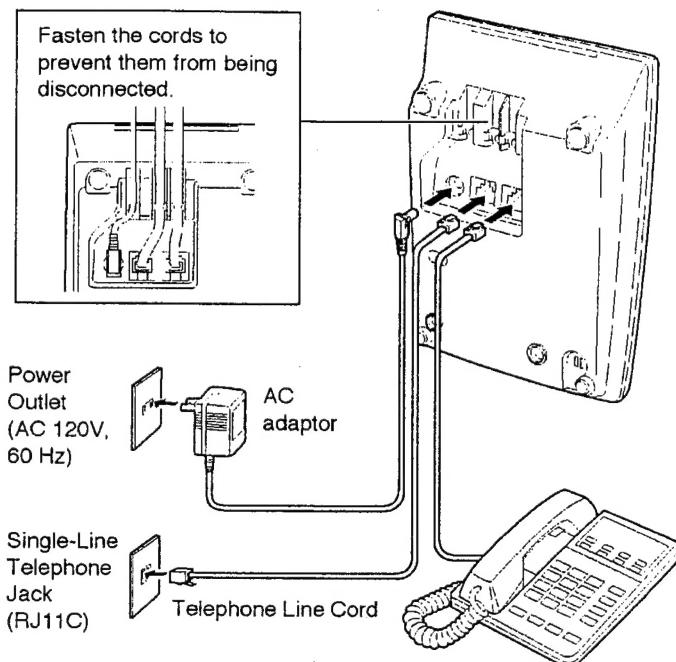
This connection is for U.S.A. version only.Refer to the simplified manual (cover) for Canada. or other areas.

· USE ONLY with Panasonic AC ADAPTOR PQLV1Z.

· The AC adaptor must remain connected at all times. (It is normal for the adaptor feel warm daring use.)

· If your unit is connected to a PBX which does not support Caller ID services, you cannot accsess those services.

4 NEW OPERATION

Selecting the Dialing Mode

You may select the dialing mode by programming. If you have touch tone service, set to "Tone". If rotary or pulse service is used, set to "Pulse". Your unit comes from the factory set to "Tone".

1 Press (FUNCTION/EDIT) until "Dialing mode" is displayed.

• The current mode is displayed.

```
Dialing mode
:Tone
      FUNCTION=Next
```

2 Press **VOLUME/SEARCH** (∧)or(∨) until the desired mode is displayed.

```
Dialing mode
:Pulse
      FUNCTION=Save
```

3 Press (FUNCTION/EDIT).

• A long beep sounds and the mode is saved.
• The display will return to the stand-by mode.

```
Dialing mode
:Pulse
```

(FUNCTION/EDIT)

(STOP)

VOLUME/SEARCH(∧) ,(∨)

• To exit the programming mode, press (STOP) or wait for 60 seconds.
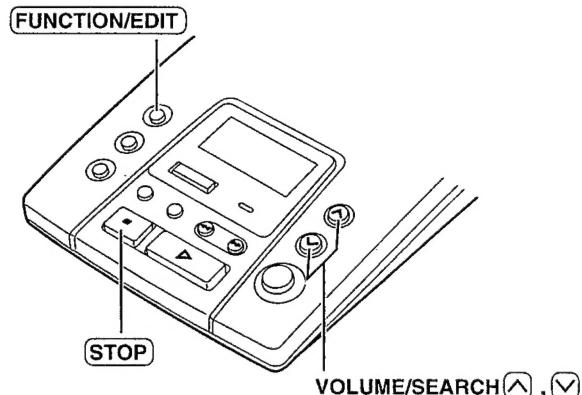
Storing Your Area Code

We recommend that you program your area code first before using the Caller ID feature. Incoming calls from the same area code will then be recorded in the Caller List without the area code. You do not have to remove the area code before calling back or storing. Also, when incoming calls from a different area code are received, "1" will automatically be added before the area code.

1 Press (FUNCTION/EDIT) until "Area code" is displayed.

• The current code is displayed.
If no area code has been programmed, "−−−" will be displayed.

```
Area code
:−−−
      FUNCTION=Next
```

2 Press VOLUME/SEARCH (∧)or(∨)until the desired number is displayed. Press (SKIP/FF) or (REPEAT/REW) to move the cursor.

• Press (ERASE) to clear the number.

```
Area code
:1−−
      FUNCTION=Save
```

3 Press (FUNCTION/EDIT).

• A long beep sounds and the code is saved.
• The display will return to the stand-by mode.
• If 6 beeps sound, a 1 or 2-digit number has been entered in step 2. Start again from step 1.

```
Area code
:123
```

• To exit the programming mode, press (STOP) or wait for 60 seconds.

To erase the area code

Press (FUNCTION/EDIT) 5 times ➧ (ERASE) ➧ (FUNCTION/EDIT).

• If a "2nd area code" has been stored, it will also be erased automatically.

Storing a Second Area Code

You can also program another local area code. This area code does not require dialing "1" before it.
After storing this area code, the display will show the 10 digits (3-digit area code plus 7-digit phone number) after a call is received from that area code. Calls will be recorded in the Caller List without "1".
You cannot store a second area code unless your area code is stored first .

1 Press (FUNCTION/EDIT) until "2nd area code" is displayed.
  • The current code is displayed. If no second area code has been programmed, "---" will be displayed.

```
2nd area code
:---
    FUNCTION=Next
```

2 Press **VOLUME/SEARCH** (⌃) or (⌄) until the desired number is displayed.
Press (SKIP/FF) or (REPEAT/REW) to move the cursor.
  • Press (ERASE) to clear the number.

```
2nd area code
:1--
    FUNCTION=Save
```

3 Press (FUNCTION/EDIT).

  • A long beep sounds and the code is saved.

  • The display will return to the stand-by mode.

  • If 6 beeps sound, your area code has not been stored. Store the code first then try again.

  • 6 beeps will also be heard if you only entered a 1 or 2-digit number in step 2. Start again from step 1.

```
2nd area code
:124
```

  • To exit the programming mode, press (STOP) or wait for 60 seconds.

• To erase the second area code

Press (FUNCTION/EDIT) 6 times ➡ (ERASE) ➡ (FUNCTION/EDIT).

Day and Time Adjustment

Voice Day/Time Stamp: During playback, a synthesized voice will announce the day and time when each message was recorded.

1 Press (FUNCTION/EDIT) until "Day/time" is displayed.
  • The current setting is displayed.

```
Day/time
SUN 12:00AM
    FUNCTION=Next
```

2 Press (SKIP/FF) or (REPEAT/REW) to move the cursor.
  • Each time you press (SKIP/FF), the cursor moves in this order:
  Day ➡ Hour ➡ Minute.

```
Day/time
SUN 12:00AM
    FUNCTION=Save
```

3 Press **VOLUME/SEARCH** (⌃) or (⌄) until the desired setting is displayed.
  • Each time you press the button, the display changes as follows.
  Day: Sun ➡ Mon ➡ Tue ➡ Wed ➡ Thu ➡ Fri ➡ Sat ➡ Sun
  Hour: 12AM ➡ 1AM ➡ ... ➡ 11AM ➡ 12PM ➡ ... ➡ 11PM ➡ 12AM
  Minute: 00 ➡ 01 ➡ ... ➡ 59 ➡ 00

```
Day/time
SUN  1:00PM
    FUNCTION=Save
```

4 Press (FUNCTION/EDIT).
  • A long beep sounds and the clock starts working.

  • The display will return to the stand-by mode.

```
Day/time
SUN  1:00PM
```

  • To exit the programming mode, press (STOP) or wait for 60 seconds.
  • The accuracy of the clock is approximately ±60 seconds a month at room temperature.

  If a power failure occurs or the AC adaptor is disconnected for more than 10 minutes, the adjusted day/time will be erased.

For Caller ID service users

  • The Caller ID information will re-set the clock after the rst ring if the adjusted time is incorrect.

  • The Caller ID information will automatically adjust the clock for daylight saving time.

Selecting the Number of Rings

You can select the number of times the unit rings before the answering system answers a call, from "2" to "7" or "Toll saver".
Your unit comes from the factory set to "Toll saver".

1 Press (FUNCTION/EDIT) until "Number of rings" is displayed.
  • The current setting is displayed.

```
Numberof rings
:Tollsaver
  FUNCTION=Next
```

2 Press **VOLUME/SEARCH**(∧) or (∨) until the desired setting is displayed.
  2–7: The unit will answer after the selected number of rings.
  Toll saver: Toll saver* function is selected.

```
Numberof rings
:2
  FUNCTION=Save
```

3 Press (FUNCTION/EDIT).
  • A long beep sounds and the setting is saved.
  • The display will return to the stand-by mode.

```
Numberof rings
:2
```

• To exit the programming mode, press (STOP) or wait for 60 seconds.

---

*Toll saver

When you call the unit from a touch tone telephone:
If the unit answers on the 2nd ring, there is at least one new message.
If the unit answers on the 4th ring, there are no new messages.
Hang up when you hear the 3rd ring. This will save you the toll charge for the call.

During playback

To **repeat/ rewind** message	**To repeat from the beginning of the message** Press (REPEAT/REW) briefly. (If you press within 5 seconds of playback, the previous message will be played.) **To rewind part of the message** Press and hold (REPEAT/REW) until you reach the desired place. • At the beginning of the message, 3 beeps will sound.
To **skip/cue** message	**To skip to the next message** Press (SKIP/FF) briey. **To cue to part of the message** Press and hold (SKIP/FF) until you reach the desired place. • The message will be heard at twice the normal speed. • At the end of the message, 3 beeps will sound.
To **stop** operation	Press (STOP). • To resume playback, press (NEW\MESSAGE). • If you do not press any button for 60 seconds or if you press (STOP) again, the unit will return to the stand-by mode.

Caller ID Service

This unit is compatible with a Caller ID service offered by your telephone company.
After you subscribe to a Caller ID service, the calling party information will be displayed after the first ring.
The unit can record information of up to 50 different callers, including the time and date received and the number of times called, in the Caller List. The Caller List information is sorted by the most recent to oldest call.
When the 51st call is received, the first call is deleted. Using the list, you can automatically call back a caller.

How caller information is displayed when a call is received

The display shows the caller's name and/or number after the first ring.

```
┌─────────────────────┐
│ TINA ROBINSON       │
│ 1-000-222-3333      │
├─────────────────────┤
│         or          │
├─────────────────────┤
│ 1-000-222-3333      │
└─────────────────────┘
```
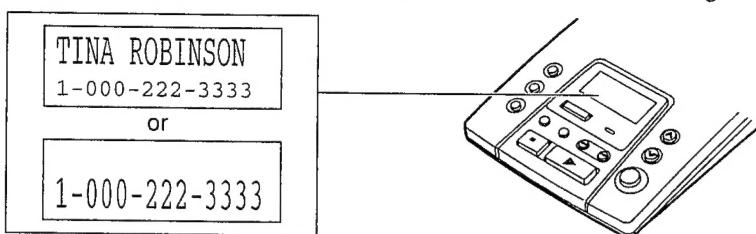
- Caller information cannot be displayed in the following cases:
  —If the caller dialed from an area which does not provide a Caller ID service, the display will show "Out of area".
  —If the caller has requested not to display his/her information, the display will show "Private caller".
- If your unit is connected to a PBX system which does not support Caller ID services, you cannot access those services.
- In some calling areas, the name display service may not be available.
  For further information, please contact your telephone company.

To check the number of new calls

You have received 5 new calls.

```
┌─────────────────────┐
│ SUN 12:00AM         │
│   5 new calls       │
│  10 messages        │
└─────────────────────┘
```

You have received no new calls.

```
┌─────────────────────┐
│ SUN 12:00AM         │
│                     │
│  10 messages        │
└─────────────────────┘
```

Using the Caller List

Viewing the Caller List

To check who has called you, follow the steps below.

1 Press (CALLER\ID/DIAL) to enter the list.
- The number of new calls will be shown.

```
┌─────────────────────┐
│   5 new calls       │
│ V=New      ∧=Old    │
└─────────────────────┘
```

2 To search from the most recent to oldest call, press
VOLUME/SEARCH ☑ (New key).
To search from the oldest to most recent call, press
VOLUME/SEARCH ☐ (old key).
- To move between callers, press **VOLUME/SEARCH** ☑ or ☐.

3 To exit the list, press (STOP).
- The display will return to the stand-by mode.

(STOP)
(FUNCTION/EDIT)
VOLUME/SEARCH ☐ , ☑

- Once new calls have been checked, "√" will be added.
- When you answer a call, it will be treated as new and "√" will not be added.
- If "No items stored" is displayed in step 1, the Caller List is empty. Press (STOP) to exit the list.
- If more than one call is received from the same caller, the date and time of the last call will be recorded. Also, when the same caller calls again, the call entry with "√" will be deleted.
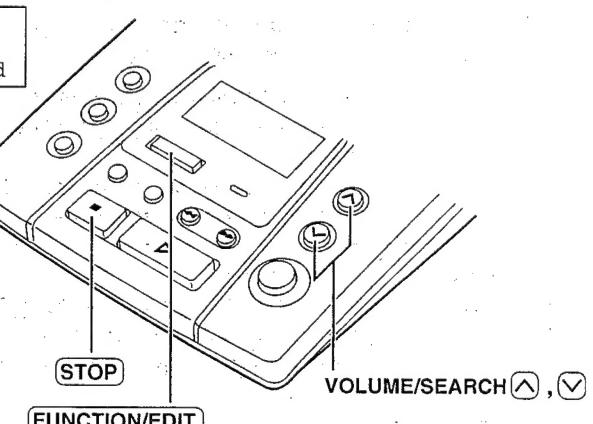
Ex. When you search from the most recent call:

Press (CALLER ID/DIAL) to enter the list.

↓

```
2 new calls
∨=New      ∧=Old
```

Press **VOLUME/SEARCH**∨.

↓

```
JACK SMITH
111-2222
 3:10PJUN10
```

Press **VOLUME/SEARCH**∨.

↓

```
KEVIN PARKER
333-4444
11:50AJUN10√
```

Press **VOLUME/SEARCH**∨.

↓

```
NANCY BROWN
222-3333
 1:54PJUN 9 X2
```

Press **VOLUME/SEARCH**∨.

↓

```
CINDY TURNER
1-234-456-7890
10:38A JUN 9 √
```

Press **VOLUME/SEARCH**∨.
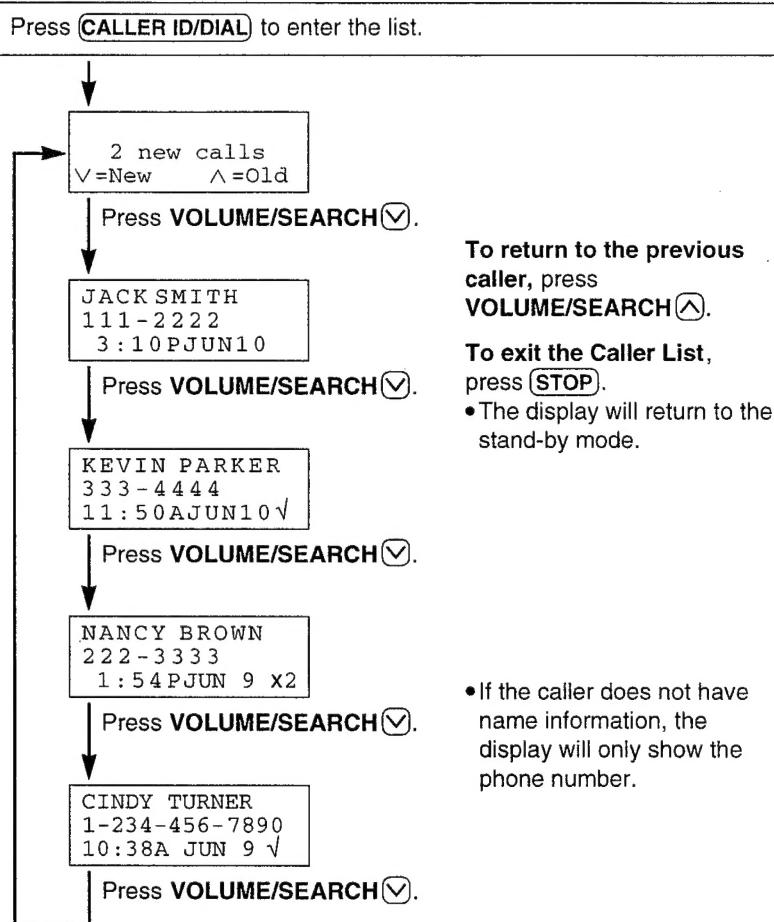
To return to the previous caller, press **VOLUME/SEARCH**∧.

To exit the Caller List, press (STOP).
- The display will return to the stand-by mode.

- If the caller does not have name information, the display will only show the phone number.

Display meaning:
√   : You have checked this caller information, called back the caller or played back the message.
x2–x9   : The number of times they called (up to 9). After checking, "x2" – "x9" will be replaced with "√".

Calling Back from the Caller List

1 Press (CALLER ID/DIAL) to enter the list.

```
 5 new calls
∨=New      ∧=Old
```

2 Press **VOLUME/SEARCH**∨or∧ repeatedly to find the desired caller.

```
CINDY TURNER
1-234-456-7890
11:20A JAN12 X3
```

3 Press (CALLER ID/DIAL).
- The displayed phone number is dialed automatically.

```
CINDY TURNER
1-234-456-7890
- Now dialing -
```

4 After dialing, two short beeps are heard and the display shows "Lift up the TEL handset and talk".

```
Lift up the TEL
handset
and talk
```

- After 10 seconds, the display will return to the stand-by mode.

5 Lift the handset of the telephone connected to the same line and talk.

- In some cases, you may have to edit the number before dialing. (Ex. You may have to add "1" for long distance calls.)
- If you did not store your area code, the edited number will not be saved in the Caller List.
- If a phone number is not displayed in the caller information, you cannot call back that caller.
- The phone number may not be dialed if you lift the handset before you press (CALLER ID/DIAL) or when "- Now dialing -" is being displayed.

Editing the Caller's Phone Number

The unit can edit a phone number into one of 4 patterns.

1 Press (CALLER ID/DIAL) to enter the list.

```
   5 new calls
V=New      Λ=Old
```

2 Press **VOLUME/SEARCH**⌄or⌃ repeatedly to find the desired caller.

```
FRED PARKER
321-5555
11:20A JAN12 x3
```

3 Press (FUNCTION/EDIT) to select a pattern.
Each time you press (FUNCTION/EDIT), the number is rearranged into one of 4 different patterns.

ⓐ1 – | Phone no. |
ⓑ1 – | Area code | – | Phone no. |
ⓒ | Area code | – | Phone no. |
ⓓ | Phone no. |

- The order in which patternsⓐ–ⓓare displayed depends on which pattern the telephone number is displayed in step 2.

ⓐ
```
FRED PARKER
1-321-5555
11:20A JAN12 x3
```

ⓑ
```
FRED PARKER
1-234-321-5555
11:20A JAN12 x3
```

ⓒ
```
FRED PARKER
234-321-5555
11:20A JAN12 x3
```

4 After editing the number, you can continue with calling back procedures.
To call back, press (CALLER ID/DIAL) .

ⓓ
```
FRED PARKER
321-5555
11:20A JAN12 x3
```

Erasing the Caller List Information

After checking the Caller List, you can erase some or all of the entries.

To erase a specic caller from the Caller List

1 Press (CALLER ID/DIAL) to enter the list.

```
   5 new calls
V=New      Λ=Old
```

2 Press **VOLUME/SEARCH**⌄or⌃ repeatedly to find the caller you want to erase from the Caller List.

```
TOM REAGAN
444-5555
12:20A JAN12 √
```

3 Press (ERASE).
- A long beep sounds and the information is erased.
- After a few seconds, the display will show the previous caller information.

```
     Clear
```

To erase all entries in the Caller List

1 Press (CALLER ID/DIAL) to enter the list.

Be sure this display is shown.

```
   0 new call
V=New      Λ=Old
```

2 Press (ERASE).
- A short beep sounds.

```
Press ERASE for
all clear
```

3 Press (ERASE) again.
- A long beep sounds and all entries are erased.
- After a few seconds, the display will return to the stand-by mode.

```
   All clear
```

(ERASE)   VOLUME/SEARCH⌃ , ⌄
(CALLER ID/DIAL)
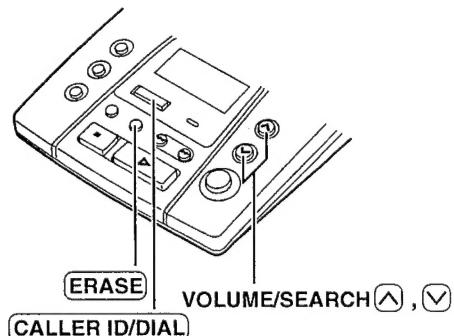
Remote Operation from a Touch Tone Phone

You can operate the answering system from any touch tone phone. A
synthesized voice menu will guide you on how to operate the unit.

Summary of remote operation

1 Call your unit from a touch tone phone.
 • The greeting message is played.

↓

2 During or after the greeting message, enter your remote code.
 (See below.)
 • The number of new messages is heard.

↓

3 After 3 seconds, the voice menu will start.
 Follow the menu or enter the direct commands.

↓

4 To end remote operation, hang up.
 • The messages are saved.

Setting the Remote Code

The remote code prevents unauthorized people from accessing your unit and listening to your messages.
Choose any **2-digit number (00–99)** . The factory preset remote code number is "**11**".
If you do not program your own remote code number, you can use "11".

1 Press (FUNCTION/EDIT) until "Remote code" is displayed.
 • The current remote code is displayed.

```
Remote code
:11
  FUNCTION=Next
```

2 Press **VOLUME/SEARCH**(∧)or(∨) until the desired code is displayed.
 • Press (ERASE) to clear the code.

```
Remote code
:23
  FUNCTION=Save
```

3 Press (FUNCTION/EDIT).
 • A long beep sounds and the code is saved.

• To exit the programming mode, press (STOP) or wait for 60 seconds.

```
Remote code
:23
```

5 DISASSEMBLY INSTRUCTIONS

(A)

Fig.1

Remove the Lower cabinet
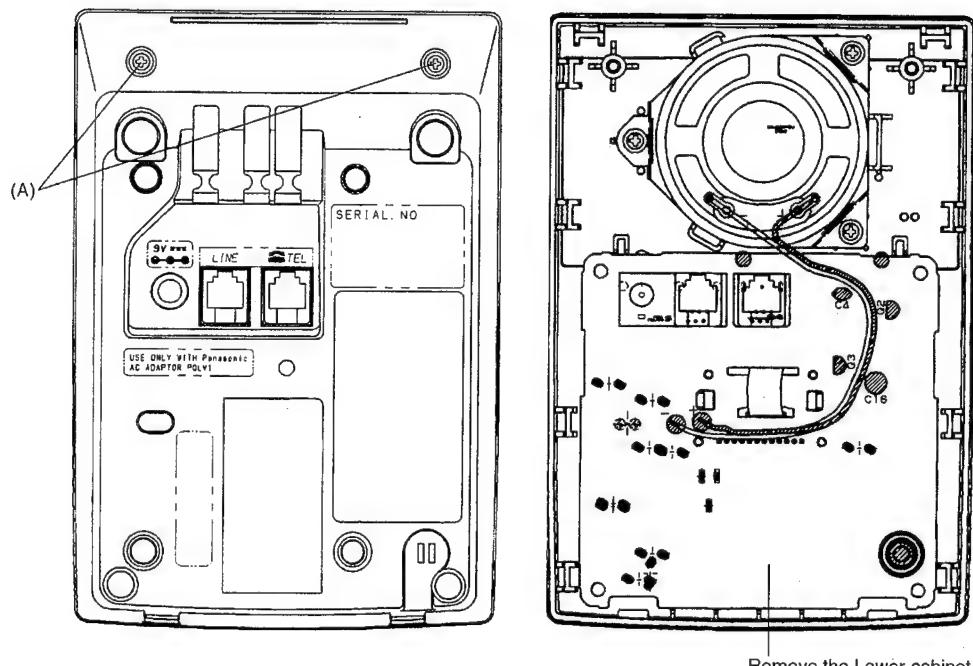
Fig.2

Ref. No	Procedure	Shown in Fig.—	To remove—.	Remove—.
1	1	1	Lower Cabinet	Screws (3×12)...............................(A)×2
2	1,2	1	Printed Circuit Board	Remove the Lower Cabinet

6 HOW TO REPLACE FLAT PACKAGE IC

6.1. PREPARATION

· SOLDER

Sparkle Solder 115A-1, 115B-1 or Almit Solder KR-19,KR-19RMA

· Soldering iron

Recommended power consumption will be between 30 W to 40 W.

Temperature of Copper Rod 662 ± 50°F (350 ± 10°C)

(An expert may handle between 60 W to 40 W iron, but beginner might damage foil by overheating.)

· Flux

HI115 Specific gravity 0.863

(Original flux will be replaced daily.)

6.2. PROCEDURE

1. Temporary fix FLAT PACKAGE IC by soldering on two marked 2 pins.
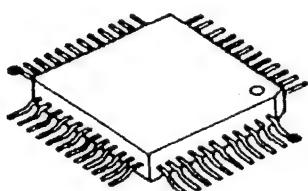
● – – – – – –Temporary soldering point.

*Most important matter is accurate setting of IC to the corresponding soldering foil.

2. Apply flux for all pins of FLAT PACKAGE IC.
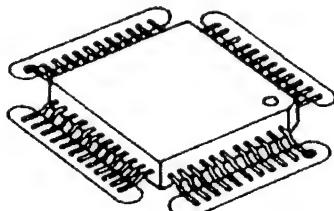
– – – – – –Flux

3. Solder employing specified solder to direction of arrow, as sliding the soldering iron.

Soldering iron

Specified solder
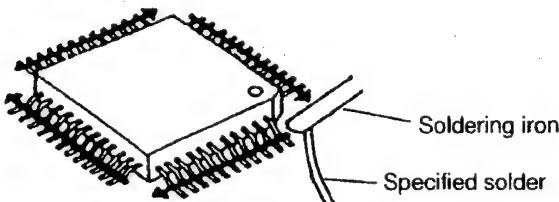
6.3. MODIFICATION PROCEDURE OF BRIDGE

1. Re-solder slightly on bridged portion.

2. Remove remained solder along pins employing soldering iron as shown in below figure.

bridge

13
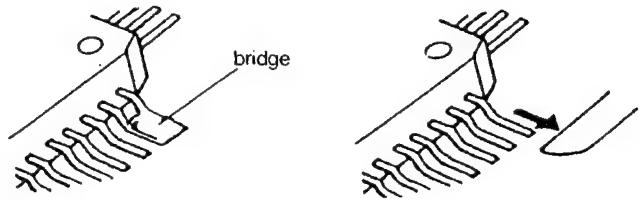
7 DSP IC DATA

7.1. IC 1
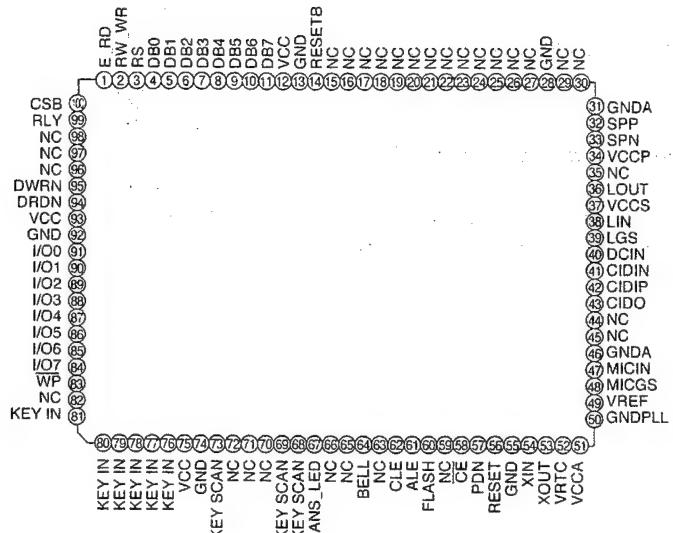
| Pin No.	Name	Description	I/O	High	Low	Pin No.	Name	Description	I/O	High	Low
1	E_RD	E_RD	O	ON		50	GNDPLL	GND			
2	PW_WR	RW_WR	O	ON		51	VCCA	PLL VCC			
3	RS	RS	O	ON		52	VRTC	RTC VCC			
4	DB0	D0 (LCD)	O	ON		53	XOUT	X'tal Out	O		
5	DB1	D1 (LCD)	O	ON		54	XIN	X'tal In	I		
6	DB2	D2 (LCD)	O	ON		55	GND	GND			
7	DB3	D3 (LCD)	O	ON		56	RESET	RESET	I		RESET
8	DB4	D4 (LCD)	O	ON		57	PDN	Power Down	I		Power Down
9	DB5	D5 (LCD)	O	ON		58	CE	CE	O		Enable
10	DB6	D6 (LCD)	O	ON		59	NC	NC			
11	DB7	D7 (LCD)	O	ON		60	FLASH	FLASH	I	TOSHIBA	SUMSONG
12	VCC	VCC				61	ALE	ALE	O	Enable	
13	GND	GND				62	CLE	CLE	O	Enable	
14	RESETB	RESETB	O	ON		63	NC	CE2			
15	NC	NC				64	BELL	BELL	I		Bell In
16~27	NC	NC				65,66	NC	NC			
28	GND	NC				67	ANS-LED	ANS_LED	O	LED OFF	LED ON
29,30	NC	NC				68,69	Key Scan	Key Scan	O	Digit ON	Digit Off
31	GNDA	ANALOG GND				70~72	NC	NC			
32	SPP	SP+out put				73	Key Scan	STB5	O	Digit ON	Digit Off
33	SPN	SP-out put				74	GND	GND			
34	VCCP	SP amp power				75	VCC	VCC			
35	NC	NC				76~81	Key In	KEYIN0~KEYIN5	I	Key In	
36	LOUT	Line Out				82	NC	NC			
37	VCCS	Analog VCC				83	WP	WP	O		Protect
38	LIN	Line In				84~91	I/O0~I/O7	IO0~IO7	I/O		
39	LGS	Line In				92	GND	GND			
40	DCIN	DC Level Detect				93	VCC	VCC			
41	CIDIN	In				94	DRDN	Flash Read Enable	O		Enable
42	CIDIP	In				95	DWRN	Flash Write Enable	O		Enable
43	CIDO	Out				96	NC	NC			
44,45	NC	NC				97	NC	NC			
46	GNDA	GND				98	NC	LINE SZ			
47	MICIN	Mic In				99	RLY	RLY	O	Line in	
48	MICGS	Mic In				100	CSB	CSB (LCD)	O		
49	VREF	Out									
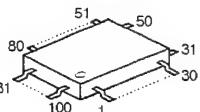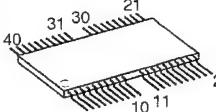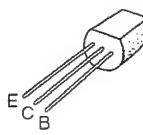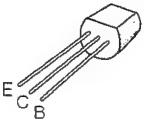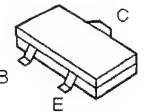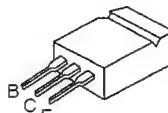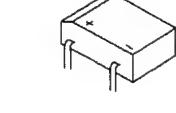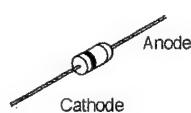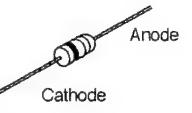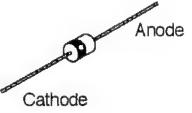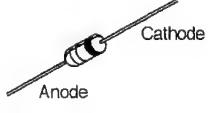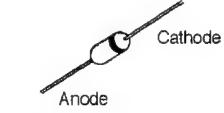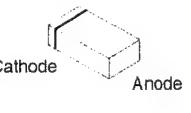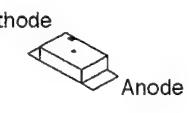
8 FLASH MEMORY

8.1. IC 2

```
              VCC ⊏ 40    1 ⊐ VSS
               CE ⊏ 39    2 ⊐ CLE
               RE ⊏ 38    3 ⊐ ALE
              R/B ⊏ 37    4 ⊐ WE
              GND ⊏ 36    5 ⊐ WP
             N.C. ⊏ 35    6 ⊐ N.C.
             N.C. ⊏ 34    7 ⊐ N.C.
             N.C. ⊏ 33    8 ⊐ N.C.
             N.C. ⊏ 32    9 ⊐ N.C.
             N.C. ⊏ 31   10 ⊐ N.C.

             N.C. ⊏ 30   11 ⊐ N.C.
             N.C. ⊏ 29   12 ⊐ N.C.
             N.C. ⊏ 28   13 ⊐ N.C.
             N.C. ⊏ 27   14 ⊐ N.C.
             N.C. ⊏ 26   15 ⊐ N.C.
             I/O7 ⊏ 25   16 ⊐ I/O0
             I/O6 ⊏ 24   17 ⊐ I/O1
             I/O5 ⊏ 23   18 ⊐ I/O2
             I/O4 ⊏ 22   19 ⊐ I/O3
              VCC ⊏ 21   20 ⊐ VSS
```

Pin No.	Name	Description	Pin No.	Name	Description
1	VSS	Ground	21	VCC	5V Power supply
2	CLE	Comand Latch Enable	22	I/O4	Data Inputs/Outputs
3	ALE	Address Latch Enable	23	I/O5	Data Inputs/Outputs
4	WE	Write Enable	24	I/O6	Data Inputs/Outputs
5	WP	Write Protect	25	I/O7	Data Inputs/Outputs
6	NC	Not Connect	26	NC	Not Connect
7	NC	Not Connect	27	NC	Not Connect
8	NC	Not Connect	28	NC	Not Connect
9	NC	Not Connect	29	NC	Not Connect
10	NC	Not Connect	30	NC	Not Connect
11	NC	Not Connect	31	NC	Not Connect
12	NC	Not Connect	32	NC	Not Connect
13	NC	Not Connect	33	NC	Not Connect
14	NC	Not Connect	34	NC	Not Connect
15	NC	Not Connect	35	NC	Not Connect
16	I/O0	Data Inputs/Outputs	36	GND	Ground
17	I/O1	Data Inputs/Outputs	37	R/B	Ready/Busy
18	I/O2	Data Inputs/Outputs	38	RE	Read Enable
19	I/O3	Data Inputs/Outputs	39	CE	Chiup Enable
20	VSS	Ground	40	VCC	5V Power supply

9 TERMINAL GUIDE OF ICS, TRANSISTORS AND DIODES

PQVI16529AAC	PQWITM150B	2SA1625	PQVT2N6517CA PQVTKSD261CY	2SD1819A PQVTDTA114EU UN5213
2SD2137	PQVDS1YB40F1	MA4180	MA4062	PQVDS5688G
MA4051	1SS133 MA723	MA110 MA8039 PQ4R10XJ154	PQVDBR1111G	

10 FOR SCHEMATIC DIAGRAM

1. SW1: Ringer selector.
2. SW2: Clock switch.
3. SW3: Code switch.
4. SW4: Memo switch.
5. SW5: Repeat switch.
6. SW6: Greeting switch.
7. SW7: All Message/Stop switch.
8. SW8: Erase switch.
9. SW9: Skip switch.
10. SW10: Answer ON switch.
11. DC voltage measurements are taken with electronic voltmeter from negative terminal of battery.
    (Add 40 mA to telephone line from the loop simulator.)
12. This schematic diagram may be modified at any time with the development of new technology.
13.

> The shades area on this schematic diagramincorporates special features important for protection from fire and electrical shock hazards.When servicing, it is essential that only manufacture⅃s specified parts be used for the critical components in the shaded areas of the schematic.

Varcap	General	Zener	LED	Photo Diode
Anode	Anode	Anode	Anode	Cathode
Cathode	Cathode	Cathode	Cathode	Anode
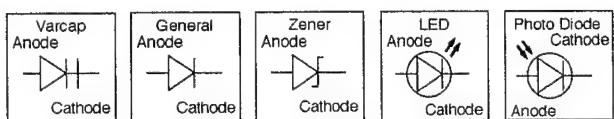
11 CIRCUIT BOARD AND WIRING CONNECTION DIAGRAM

11.1. (Component View)
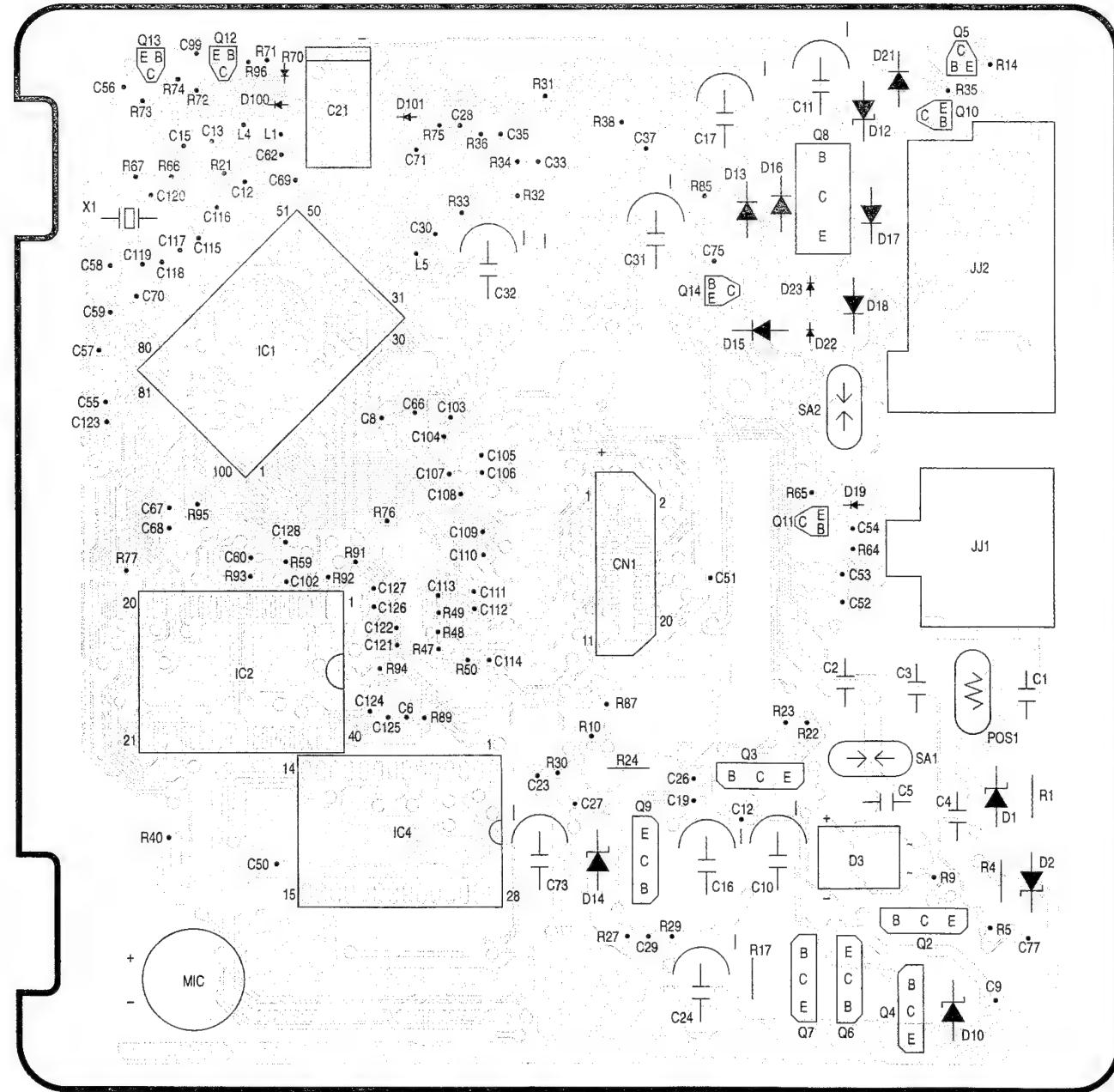
11.2. (Bottom View)
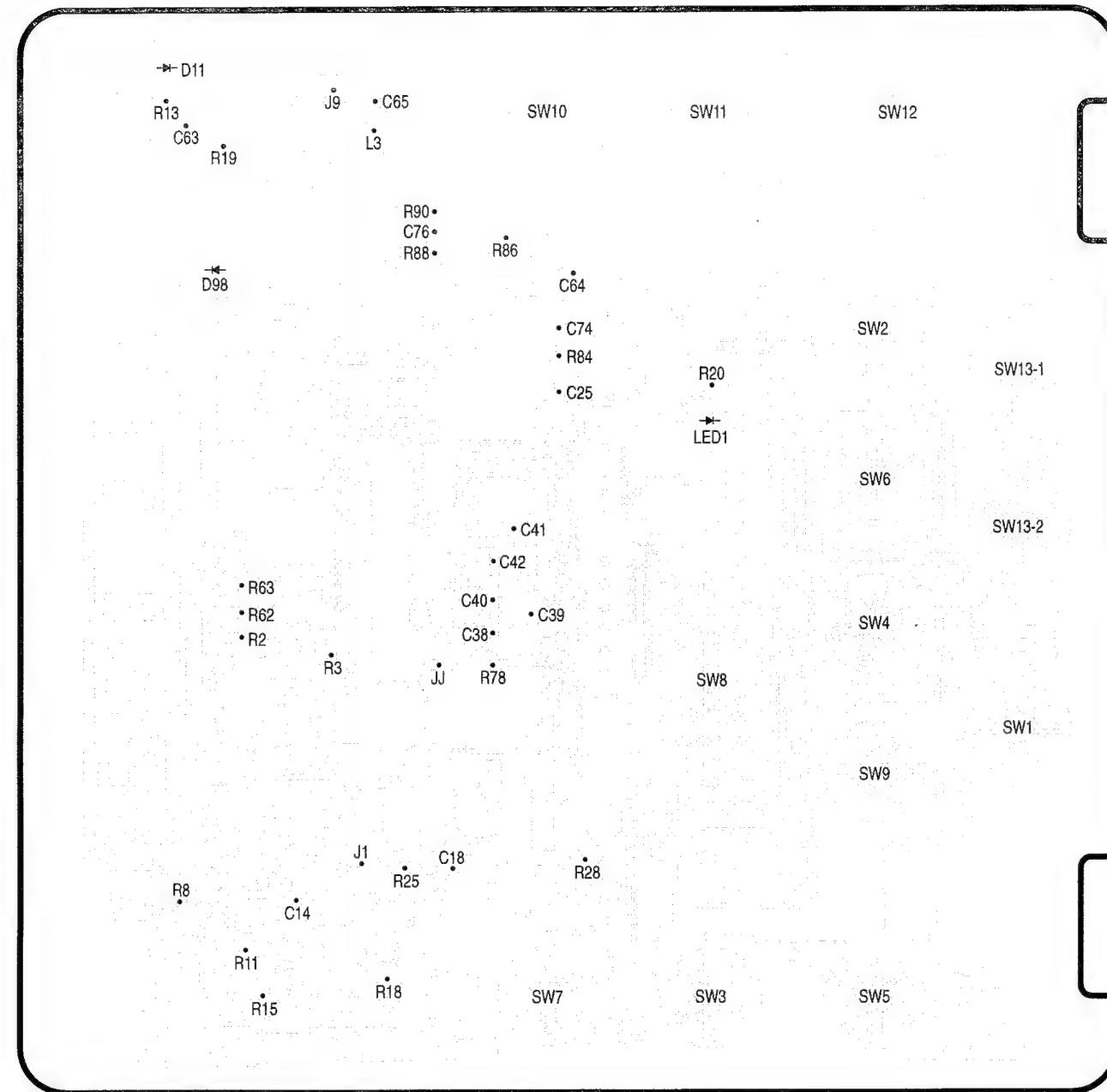
NOTE:
This circuit board may be modified at any time with the development of new technology.

12 SCHEMATIC DIAGRAM

RXSIGNAL

TXSIGNAL
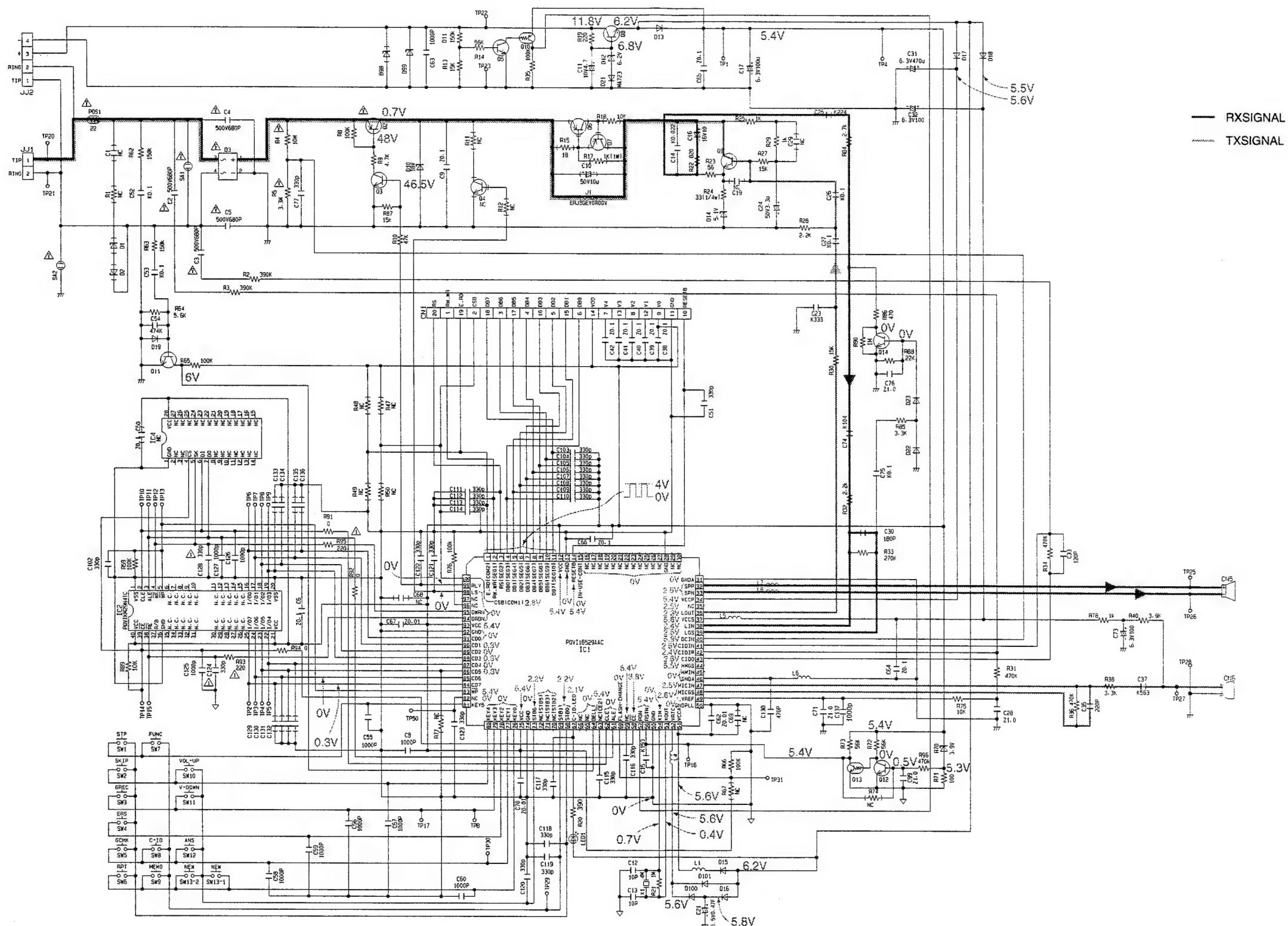
13 BLOCK DIAGRAM

ERROR: \\De-server2\for_mac03\Matsumotosan\KX_TM150B\image\13.pdf

ERROR: \\De-server2\for_mac03\Matsumotosan\KX_TM150B\image\13.pdf

14 CIRCUIT OPERATIONS

Note:The circuit diagram may be modified at any time with the development of new technology.

14.1. INITIALIZING CIRCUIT

Function:This circuit intializes the CPU when the AC adaptor is connected.

Circuit Operation:D17 → D50 → R96 → Q12 → Q13 → Pin 56 of IC1.
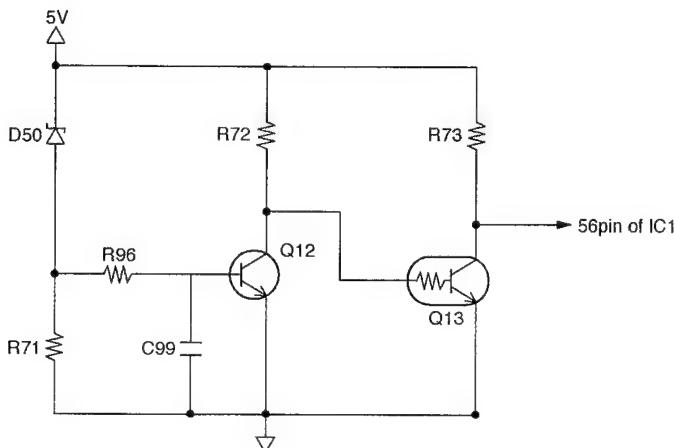
14.2. GREETING RECORD CIRCUIT

Circuit Operation:

MIC → C37 → R38 → Pin 47 of IC1.
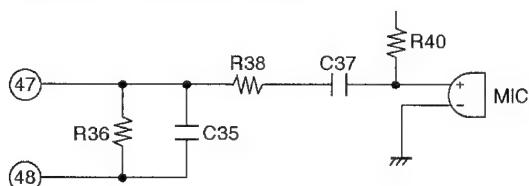
14.3. ICM 2WAY RECORDNG CIRCUIT

Circuit Operation:

Tel Line → POS1 → D3 → Q2 → C14 → C25 → R84 → C74 → R32 → Pin39 of IC1.
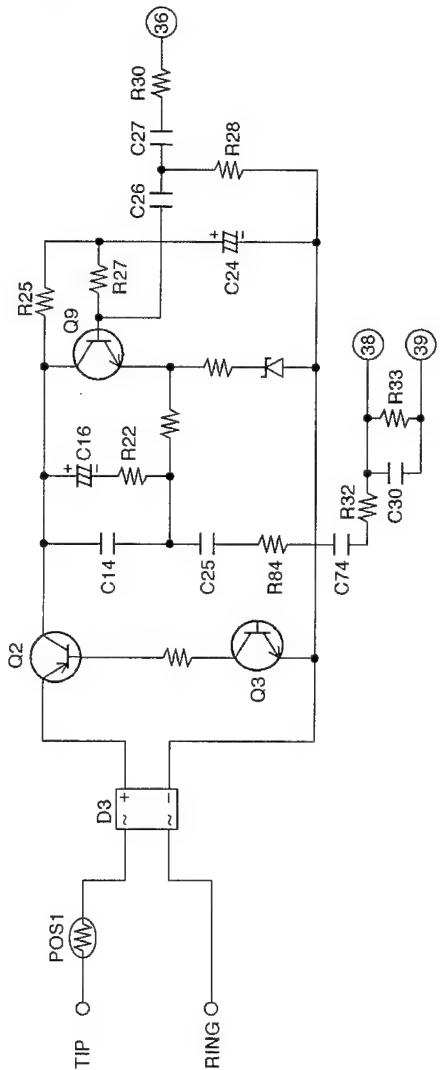
14.4. ICM PLAY CIRCUIT

Circuit Operation:

Pin 32 and Pin 33 output.
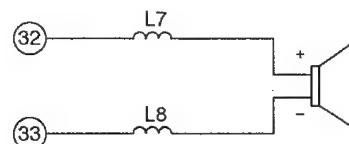
14.5. RING DITECTION CIRCUIT

Function:

This circuit activates the CPU to respond to the ring signal from the telephone line during the ANSWER mode of operation.

Circuit operation:
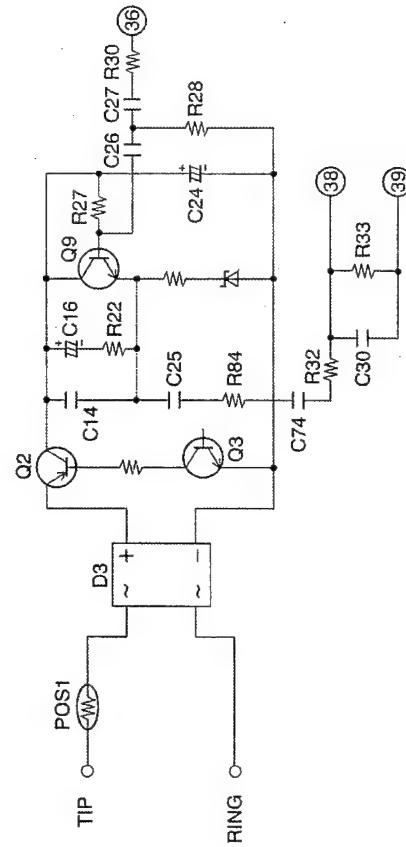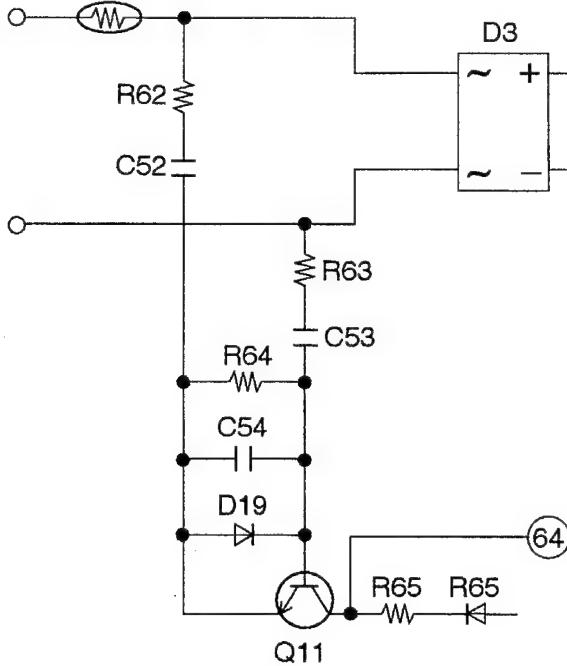
14.6. LINE OUTPUT CIRCUIT

Circuit operation:

Pin 36 of IC1 → R30 → C26 → Q9 → Q2 → D3 → POS1 → Tel Line.

14.7. AUTO DISCONNECT CIRCUIT

Function:

This circuit is used to detect the fact that another telephone connected to the same line is OFF-HOOK while the unit is in a receiving status or Greeting message transmitting status.

Circuit Operation:

1. The set receives the ring signal, then gets to OFF-HOOK(seizes line).

2. After 130mSec, IC1 starts monitoring the voltage of Pin 40.

3. When another telephone is OFF-HOOK the voltage of Pin 40 drops.

4. If the voltage drop is more than 0.12V, the unit disconnects the line.
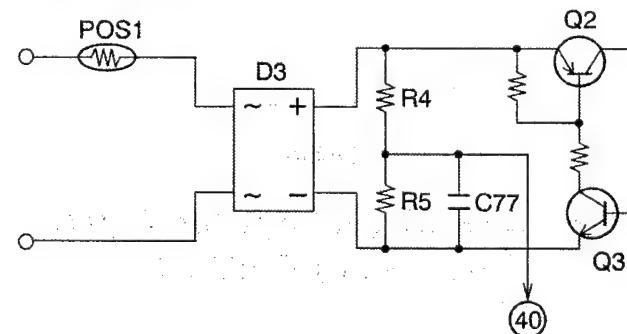
14.8. POWER SUPPLY CIRCUIT

Function:

Power from the AC adaptor passes through the 1-stage

regulating block consisting of Q8, and provides system voltages of 5V.

Circuit Operation:

Power from the AC adaptor is supplied directly to J2 A. Q8 is the first stage regulated power supply. The voltage at point B is regulated 5.9 V. The 5.9 V voltage is shifted by D13, D15, D101, D17, D18, to 5.3 V.

D13 : DSP Logic and Flash Memory.

D15 : PLL of DSP

D101 : Real time clock

D17 : Speaker Amp

D18 : Analog Amp

The DSP system comprises of following:

- a Digital Signal Processor which includes the firmware implemented functions.

-Flash Memory (IC2) , which is used for stored voice messages and synthesized voice.
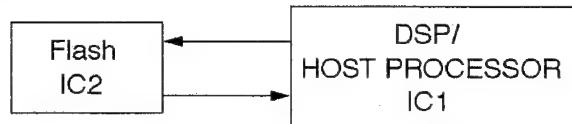
· Voice Message Recording

The DSP system use a proprietary speech compression technique to record and store voice message in

Flash Memory IC2. An error correction algorithm is used to enable playback of these messages from the Flash.

· DTMF Detection

The DTMF detection is implemented by the DSP system in software. The DTMF detection is performed during Record, Playback, and Line Monitoring modes of operation.

· Synthesized Voice

The DSP implements synthesized Voice, utilizing the built in speech detector and Flash Memory, which stored the vocabulary.

14.9. DSP (Digital Speech/Signal Processing) CIRCUIT

General Description:

IC1 and IC2 are a digital speech/signal processing system that implements all the functions of speech compression, record and playback, and memory management required in a digital telephone answering machine.

The DSP system is fully controlled by a host processor in IC1. The host processor provides activation and control of all that functions, such as speech Recording, Playback, Tone detecting and Line Monitoring.

15 TROUBLESHOOTING GUIDE

Symptom	Cause and Remedy

Unit dose not operate.	· Check if the AC adaptor is defective:
	  Replace AC adaptor.
	
	· Defective voltage regulator circuit:
	  Replace the defective component(s).

Cannot record OGM.	· Defective MIC input circuit and related circuit: Replace the defective component(s).
No response to call.	· Defective IC1 or Q11 circuit: Replace the defective component(s).

Cannot record ICM.	· Defective Q13, Bridge circuit:
	  Replace the defective component(s).
	
	· Defective Q9:
	  Replace the defective component(s).

Cannot hear message on the speaker.	· Defective IC1 speaker output circuit: Replace the defective component(s).

15.1. FUNCTIONS DO NOT OPERATE

```
┌──────────────────────┐
│ Is the AC Adaptor    │
│ inserted into 120V   │
│ outlet?              │
└──────────────────────┘
            │
            ▼
┌──────────────────────┐   NO   ┌──────────────────────┐
│ Is corrector of Q8   │──────▶ │ Check Q8 and input   │
│ voltage 6V?          │        │ voltage.             │
└──────────────────────┘        └──────────────────────┘
            │ YES
            ▼
┌──────────────────────┐   NO   ┌──────────────────────┐
│ Is cathode of D13    │──────▶ │ Check D13.           │
│ voltage 5V?          │        │                      │
└──────────────────────┘        └──────────────────────┘
            │ YES
            ▼
┌──────────────────────┐   NO   ┌──────────────────────┐
│ Is cathode of D101   │──────▶ │ Check D101.          │
│ voltage 5V?          │        │                      │
└──────────────────────┘        └──────────────────────┘
            │ YES
            ▼
┌──────────────────────┐   NO   ┌──────────────────────┐
│ Is cathode of D15    │──────▶ │ Check D15.           │
│ voltage 5V?          │        │                      │
└──────────────────────┘        └──────────────────────┘
            │ YES
            ▼
┌──────────────────────┐
│ Does a reset signal at│  NO   ┌──────────────────────┐
│ pin 56 of IC1?       │──────▶ │ Check R70, R71, R96, │
│           ┌─┐        │        │ C99, Q12, R72, R73, Q13.│
│        ┌──┘ │        │        └──────────────────────┘
│   ─────┘    ▼        │
└──────────────────────┘
            │ YES
            ▼
┌──────────────────────┐   NO   ┌──────────────────────┐
│ Is IC 57 pin voltage │──────▶ │ Check D11, R13, R14, Q5,│
│ 5V?                  │        │ Q10, R35.            │
└──────────────────────┘        └──────────────────────┘
            │ YES
            ▼
┌──────────────────────┐
│ Does pin 53 of IC1   │
│ oscillate at 4.096MHz?│
└──────────────────────┘
            │ YES
            ▼
┌──────────────────────┐
│ Check IC1.           │
└──────────────────────┘
```

15.2. DOES NOT RECORD

Greeting Message

```
┌──────────────────────┐   NO   ┌──────────────────────┐
│ Check MIC signal.    ├───────▶│ Check Mic (CN6), R78,│
│                      │        │ R40.                 │
│ /\/\/\/\/\/\/\       │        └──────────────────────┘
└──────────┬───────────┘
           │ YES
           ▼
┌──────────────────────┐   NO   ┌──────────────────────┐
│ Check pin 48 of IC1  ├───────▶│ Check pin 37 of IC1  │
│ signal. /\/\/\/\/\   │        │ voltage and R36,     │
│                      │        │ C35, R38, C37.       │
└──────────┬───────────┘        └──────────────────────┘
           │ YES
           ▼
┌──────────────────────┐
│ Check IC1.           │
│                      │
└──────────────────────┘
```

Incomming Message

```
┌──────────────────────┐   NO   ┌──────────────────────┐
│ Check pin 64 of IC1  ├───────▶│ Check R62, R63, C52, C53, │
│ signal when bel is   │        │ R64, D19, Q11, R65.  │
│ input.               │        └──────────────────────┘
│     _  _  _  _       │
│    | || || |         │
└──────────┬───────────┘
           │ YES
           ▼
┌──────────────────────┐   NO   ┌──────────────────────┐
│ Does the unit catch  ├───────▶│ Check Q2, Q3, R9, R10, D3, │
│ the line?            │        │ POS1.                │
└──────────┬───────────┘        └──────────────────────┘
           │ YES
           ▼
┌──────────────────────┐   NO   ┌──────────────────────┐
│ Check pin 39 of IC1  ├───────▶│ Check Q9, R24, D14, C25, │
│ signal.              │        │ R84, C74, R32, C30, R33 │
│                      │        │ and pin 39 voltage.  │
└──────────┬───────────┘        └──────────────────────┘
           │ YES
           ▼
┌──────────────────────┐
│ Check IC1.           │
└──────────────────────┘
```

15.3. DOES NOT PLAY BACK

```
┌──────────────────────┐   NO   ┌──────────────────────┐
│ Is pin 32, 33 of IC1 ├───────▶│ Check D17, D18.      │
│ voltage 5V?          │        └──────────────────────┘
└──────────┬───────────┘
           │ YES
           ▼
┌──────────────────────┐   NO   ┌──────────────────────┐
│ Check pin 32, 33 of IC1 ├────▶│ Check IC1.           │
│ signal.              │        └──────────────────────┘
└──────────┬───────────┘
           │ YES
           ▼
┌──────────────────────┐
│ Check speaker.       │
└──────────────────────┘
```

16 CABINET AND ELECTRICAL PARTS LOCATION

2

4

1

5

A

A

A

E2

PCB1

E3

E1

6

B

3

B
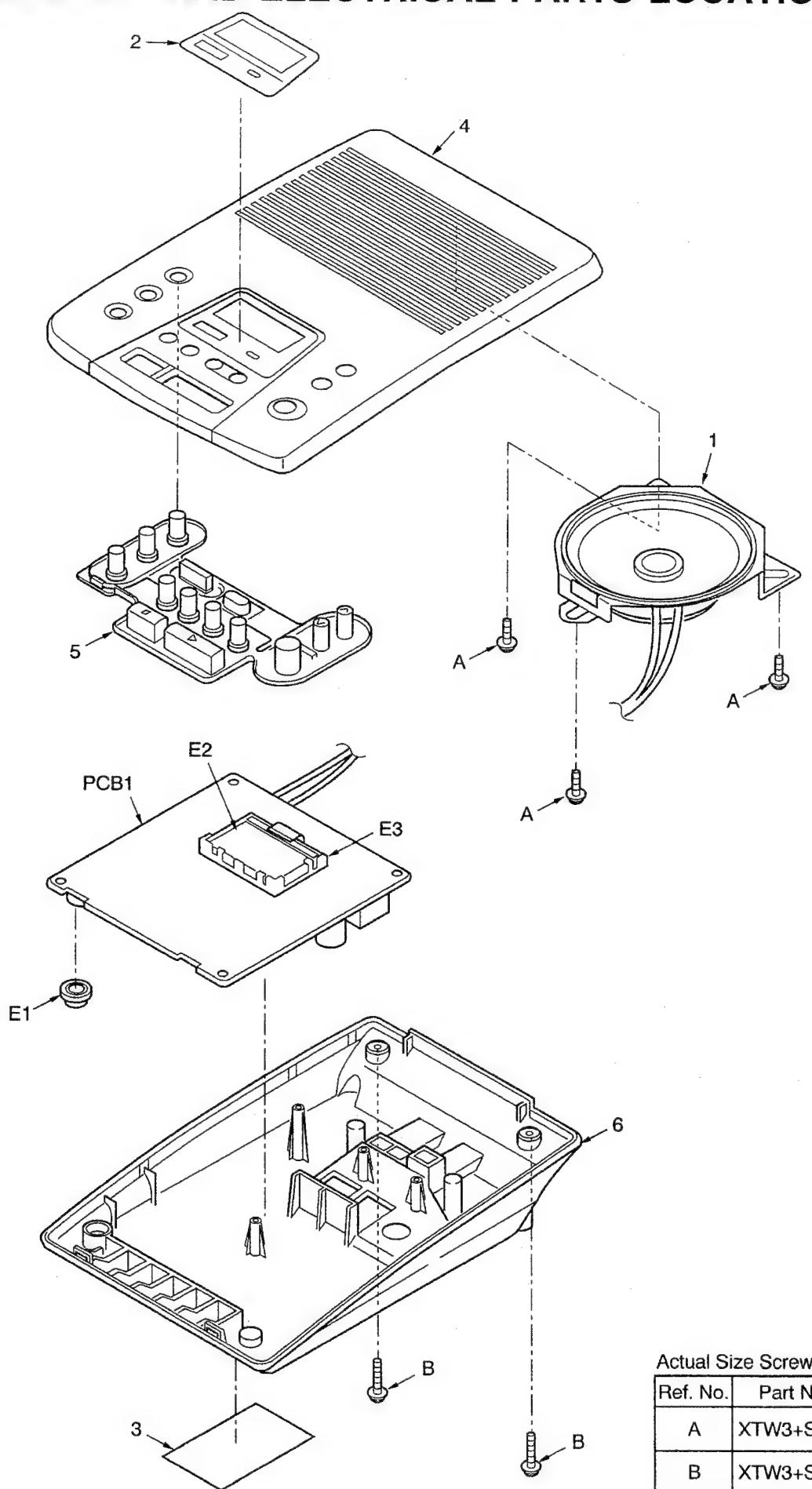
Actual Size Screws

Ref. No.	Part No.	Figure
A	XTW3+S8P	
B	XTW3+S12P	

17 ACCESSORIES AND PACKING MATERIALS

A2

A3~A5

P2

A1

P1
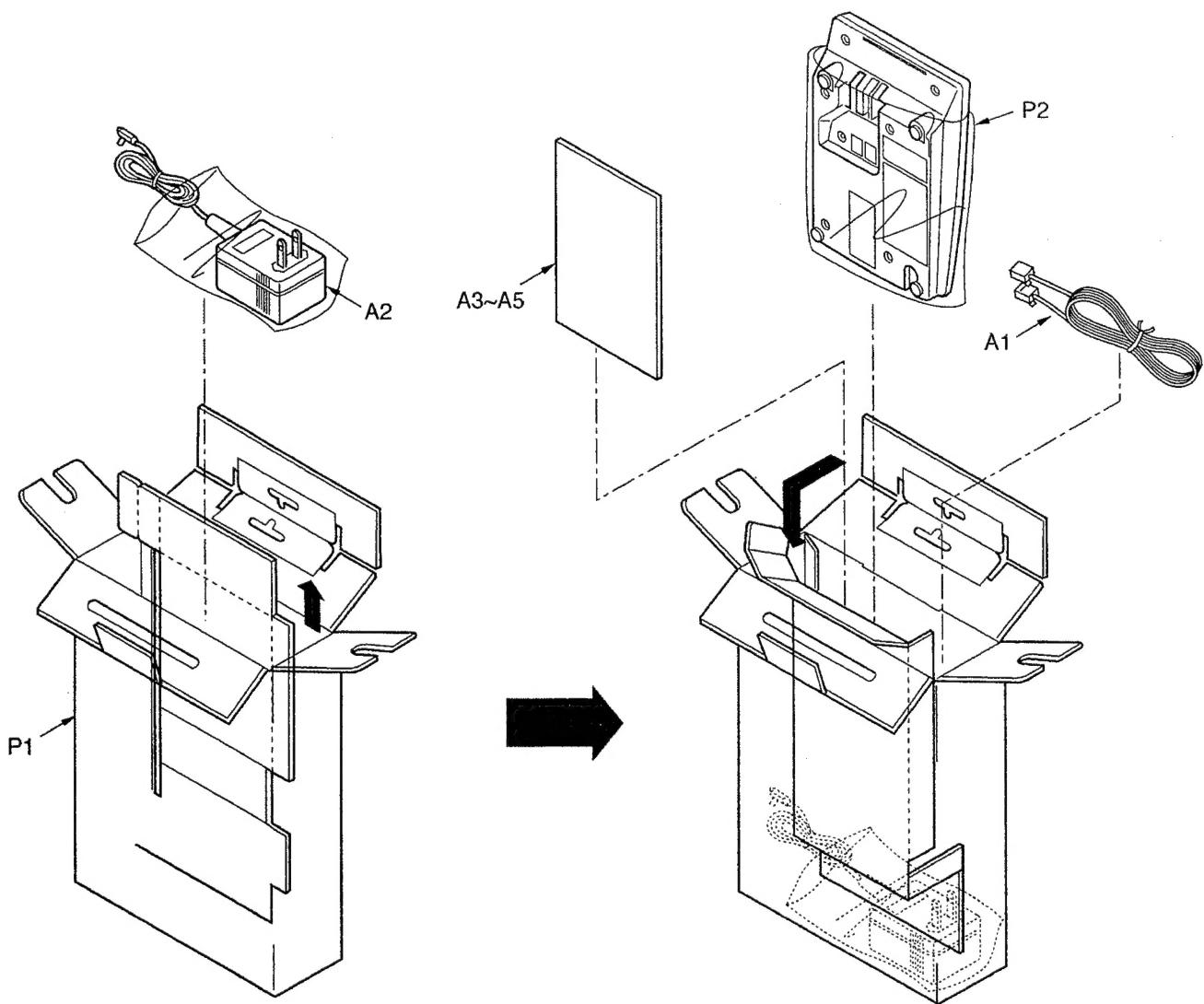
18 REPLACEMENT PART LIST

This replacement parts list is U.S.A. version only.

Refer to the simplified manual (cover) for Canada or other areas.

1. RTL (Retention Time Limited)

   Note:

   The marking (RTL) indicates that the Retention Time is limited for this item.

   After the discontinuation of this assembly in production, the item will continue to be available for a specific period of time. The retention period of availability depends on the type of assembly and the laws governing parts and product retention. At the end of this period, the assembly will no longer be available.

2. Important safety notice

   Components identified by the ⚠ mark indicates special characteristics important for safety. When replacing any of these components, only use specified manufacture's parts.

3. The S mark indicates service standard parts and may differ from production parts.

4. RESISTORS & CAPACITORS

   Unless otherwise specified;

   All resistors are in ohms (Ω) K=1000Ω, M=1000kΩ

   All capacitors are in MICRO FARADS (μF)P=μF

   *Type & Wattage of Resistor

Type

ERC:Solid	ERX:Metal Film	PQ4R:Carbon
ERD:Carbon	ERG:Metal Oxide	ERS:Fusible Resistor
PQRD:Carbon	ER0:Metal Film	ERF:Cement Resistor

Wattage

10,16:1/8W	14,25:1/4W	12:1/2W	1:1W	2:2W	3:3W

*Type & Voltage of Capacitor

Type

ECFD:Semi-Conductor	ECCD,ECKD,ECBT,PQCBC : Ceramic
ECQS:Styrol	ECQE,ECQV,ECQG : Polyester
PQCUV:Chip	ECEA,ECSZ : Electrolytic
ECQMS:Mica	ECQP : Polypropylene

Voltage

ECQ Type	ECQG ECQV Type	ECSZ Type	Others	
1H: 50V	05: 50V	0F:3.15V	0J :6.3V	1V :35V
2A:100V	1:100V	1A:10V	1A :10V	50,1H:50V
2E:250V	2:200V	1V:35V	1C :16V	1J :63V
2H:500V		0J:6.3V	1E,25:25V	2A :100V

18.1. CABINET AND ELECTRICAL PARTS

Ref. No.	Part No.	Part Name & Description	Remarks
		CABINET AND ELECTRICAL PARTS	
1	PQAS57P03Y	SPEAKER	
2	PQGP10146Z1	LCD PANEL	
3	PQGT13524Z	NAME PLATE	
4	PQKM10372Z1	UPPER CABINET	
5	PQSX10094Z	KEYBOARD SWITCH	
6	PQYF10147X1	LOWER CABINET	

Ref. No.	Part No.	Part Name & Description	Remarks
A1	PQJA10075Z	TEL CORD	
A2	PQLV1Z	AC ADAPTOR	⚠
A3	PQQW12091Z	QUICK REFERENCE GUIDE (English)	
A4	PQQW12092Z	QUICK REFERENCE GUIDE (Spanish)	
A5	PQQX12176Z	INSTRUCTION BOOK	
P1	PQPK12770Y	GIFT BOX	
P2	XZB20X35A01	PROTECTION COVER	

18.2. MAIN P.C.BOARD PARTS

Ref. No.	Part No.	Part Name & Description	Remarks
PCB1	PQWPTM150B	MAIN P.C.BOARD ASS'Y	
		(ICS)	
IC1	PQVI16529AAC	IC	
IC2	PQWITM150B	IC	
		(TRANSISTORS)	
Q 2	2SA1625	TRANSISTOR(SI)	
Q 3	PQVT2N6517CA	TRANSISTOR(SI)	
Q 5	2SD1819A	TRANSISTOR(SI) (2SC4081ST106)	
Q 8	2SD2137	TRANSISTOR(SI)	
Q 9	PQVTKSD261CY	TRANSISTOR(SI)	S
Q10	PQVTDTA114EU	TRANSISTOR(SI)	
Q11	2SD1819A	TRANSISTOR(SI) (2SC4081ST106)	
Q12	2SD1819A	TRANSISTOR(SI) (2SC4081ST106)	
Q13	UN5213	TRANSISTOR(SI)	S
Q14	2SD1819A	TRANSISTOR(SI) (2SC4081ST106)	
		(DIODES)	
D 3	PQVDS1YB40F1		S
D10	MA4180	DIODE(SI)	
D11	PQ4R10XJ154	CARBON FILM RESISTOR	S
D12	MA4062	DIODE(SI)	
D13	PQVDS5688G	DIODE(SI)	
D14	MA4051	DIODE(SI)	
D15	1SS133	DIODE(SI) (or MA165 or 1SS119)	
D16	1SS133	DIODE(SI) (or MA165 or 1SS119)	
D17	PQVDS5688G	DIODE(SI)	
D18	1SS133	DIODE(SI) (or MA165 or 1SS119)	
D19	MA110	DIODE(SI)	
D21	MA723	DIODE(SI)	
D22	MA110	DIODE(SI)	
D23	MA110	DIODE(SI)	
D100	MA110	DIODE(SI)	

Ref. No.	Part No.	Part Name & Description	Remarks
D101	MA110	DIODE(SI)	
R70	MA8039	DIODE(SI)	
LED1	PQVDBR1111C	LED	S
		(COILS)	
L 1	PQLQR2KA113T	COIL	
L 4	PQLQR2KA113T	COIL	
L 5	PQLQR2KA113T	COIL	
L 6	PQLQR2KA113T	COIL	
L 7	PQLQR2KA213T	COIL	
L 8	PQLQR2KA213T	COIL	
		(JACKS)	
JJ1	PQJJ1T020Z	JACK,	
JJ2	PQJJ2H003Z	JACK,	
		(VARISTORS)	
SA1	PQVDDSS301L	VARISTOR	
SA2	PQVDDSS301L	VARISTOR	
		(OTHERS)	
CN1	PQJS20A62Z	CONNECTOR	
CN6	PQJM122Z	MICROPHONE	
POS1	PQRPAR390N	THERMISTOR	S
X1	PQVCK4096N9Z	CRYSTAL OSCILLATOR	
E1	PQMG10023Z	MIC RUBBER	
E2	LNY153J01	LCD	
E3	PQHR10653Z	LCD HOLDER	
		(RESISTORS)	
R 2	ERJ3GEYJ394	390K	
R 3	ERJ3GEYJ394	390K	
R 4	ERDS2TJ106	10M	
R 5	ERJ3GEYJ335	3.3M	
R 8	ERJ3GEYJ104	100K	
R 9	ERJ3GEYJ472	4.7K	
R10	ERJ3GEYJ473	47K	
R13	ERJ3GEYJ153	15K	
R14	ERJ3GEYJ563	56K	
R19	PQ4R10XJ221	220	S
R20	ERJ3GEYJ391	390	
R21	ERJ3GEYJ105	1M	
R22	ERJ3GEYJ821	820	
R23	ERJ3GEYJ560	56	
R24	ERDS2TJ330	33	
R25	ERJ3GEYJ102	1K	
R27	ERJ3GEYJ153	15K	
R28	ERJ3GEYJ222	2.2K	
R29	ERJ3GEYJ102	1K	
R30	ERJ3GEYJ153	15K	
R31	ERJ3GEYJ474	470K	
R32	ERJ3GEYJ222	2.2K	
R33	ERJ3GEYJ274	270K	
R34	ERJ3GEYJ474	470K	
R35	ERJ3GEYJ104	100K	
R36	ERJ3GEYJ474	470K	
R38	ERJ3GEYJ332	3.3K	
R40	ERJ3GEYJ392	3.9K	
R59	ERJ3GEYJ104	100K	
R62	ERJ3GEYJ154	150K	

Ref. No.	Part No.	Part Name & Description	Remarks
R63	ERJ3GEYJ154	150K	
R64	ERJ3GEYJ562	5.6K	
R65	ERJ3GEYJ104	100K	
R66	ERJ3GEYJ104	100K	
R71	ERJ3GEYJ101	100	
R72	ERJ3GEYJ563	56K	
R73	ERJ3GEYJ563	56K	
R75	ERJ3GEYJ103	10K	
R76	ERJ3GEYJ104	100K	
R78	ERJ3GEYJ102	1K	
R84	ERJ3GEYJ272	2.7K	
R85	ERJ3GEYJ332	3.3K	
R86	ERJ3GEYJ471	470	
R87	ERJ3GEYJ153	15K	
R88	ERJ3GEYJ223	22K	
R89	ERJ3GEYJ103	10K	
R90	ERJ3GEYJ105	1M	
R91	ERJ3GEYJ0R00	0	
R92	ERJ3GEYJ0R00	0	
R93	ERJ3GEYJ221	220	
R94	ERJ3GEYJ0R00	0	
R95	ERJ3GEYJ221	220	
R96	ERJ3GEYJ474	470K	
J1	ERJ3GEYJ0R00	0	
		(CAPACITORS)	
C 2	ECKD2H681KB	680P	S
C 3	ECKD2H681KB	680P	S
C 4	ECKD2H681KB	680P	S
C 5	ECKD2H681KB	680P	S
C 6	ECUV1C104ZFV	0.1	
C 8	ECUV1H102KBV	0.001	
C 9	ECUV1C104ZFV	0.1	
C11	ECEA1HKS4R7	4.7	S
C12	ECUV1H100DCV	10P	S
C13	ECUV1H100DCV	10P	S
C14	ECUV1H223KBV	0.022	S
C15	ECUV1H153KBV	0.015	
C16	ECEA1HU100	10	S
C17	ECEA1AU101	100	S
C21	EECFM5R5473	0.047	
C23	ECUV1H333KDV	0.033	S
C24	ECEA1HU3R3	3.3	
C26	ECUV1C104KBV	0.1	
C27	ECUV1C104KBV	0.1	
C28	ECUV1A105ZFV	1	
C30	ECUV1H181JCV	180P	
C31	ECEA0JU471	470	
C32	ECEA1AU101	100	S
C33	ECUV1H121JCV	120P	
C35	ECUV1H221JCV	220P	
C37	ECUV1C563KBV	0.056	
C38	ECUV1C104ZFV	0.1	
C39	ECUV1C104ZFV	0.1	
C40	ECUV1C104ZFV	0.1	
C41	ECUV1C104ZFV	0.1	
C42	ECUV1C104ZFV	0.1	
C51	ECUV1H331JCV	330P	S
C52	PQCUV1H104ZF	0.1	
C53	PQCUV1H104ZF	0.1	
C54	ECUV1A474KBV	0.47	
C55	ECUV1H102KBV	0.001	
C56	ECUV1H102KBV	0.001	

Ref. No.	Part No.	Part Name & Description	Remarks
C57	ECUV1H102KBV	0.001	
C58	ECUV1H102KBV	0.001	
C59	ECUV1H102KBV	0.001	
C60	ECUV1H102KBV	0.001	
C62	ECUV1H103KBV	0.01	S
C63	ECUV1H102KBV	0.001	
C64	ECUV1C104ZFV	0.1	
C65	ECUV1C104ZFV	0.1	
C66	ECUV1C104ZFV	0.1	
C67	ECUV1H103KBV	0.01	S
C70	ECUV1H103KBV	0.01	S
C71	ECUV1A105ZFV	1	
C73	ECEA1AU101	100	S
C75	ECUV1C104KBV	0.1	
C76	ECUV1A105ZFV	1	
C77	ECUV1H331JCV	330P	S
C99	ECUV1A105ZFV	1	
C102	ECUV1H331JCV	330P	S
C103	ECUV1H331JCV	330P	S
C104	ECUV1H331JCV	330P	S
C105	ECUV1H331JCV	330P	S
C106	ECUV1H331JCV	330P	S
C107	ECUV1H331JCV	330P	S
C108	ECUV1H331JCV	330P	S
C109	ECUV1H331JCV	330P	S
C110	ECUV1H331JCV	330P	S
C111	ECUV1H331JCV	330P	S
C112	ECUV1H331JCV	330P	S
C113	ECUV1H331JCV	330P	S
C114	ECUV1H331JCV	330P	S
C115	ECUV1H331JCV	330P	S
C116	ECUV1H331JCV	330P	S
C117	ECUV1H331JCV	330P	S
C118	ECUV1H331JCV	330P	S
C119	ECUV1H331JCV	330P	S
C120	ECUV1H331JCV	330P	S
C121	ECUV1H331JCV	330P	S
C122	ECUV1H331JCV	330P	S
C123	ECUV1H331JCV	330P	S
C124	ECUV1H331JCV	330P	S
C125	ECUV1H102KBV	0.001	
C126	ECUV1H102KBV	0.001	
C127	ECUV1H102KBV	0.001	
C128	ECUV1H331JCV	330P	S
C137	ECUV1H102KBV	0.001	
C138	ECUV1H471JCV	470P	S